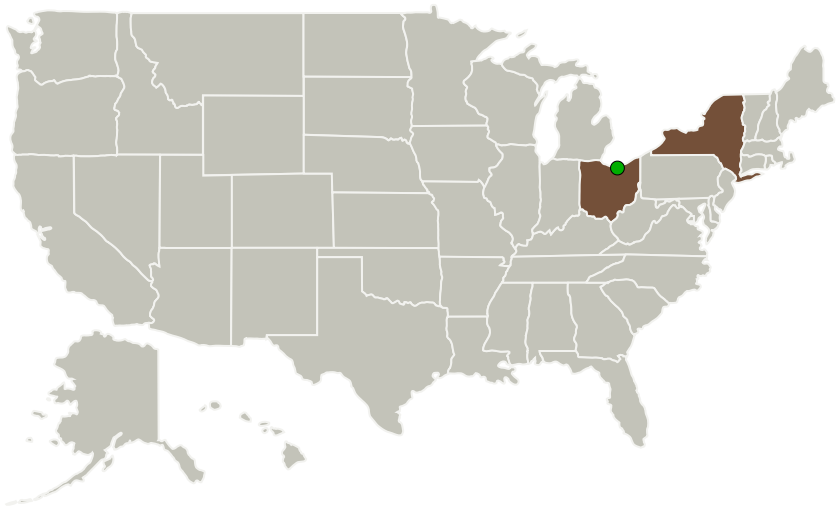
High Effectiveness and Low Pressure Drop Recuperator for Closed Brayton Cycle Turboalternator, Phase I

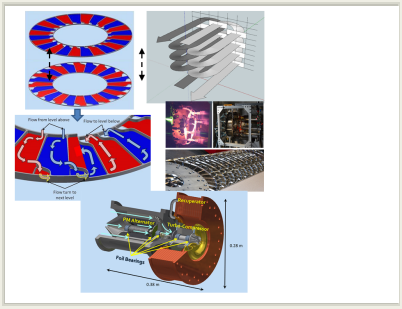
Completed Technology Project (2017 - 2017)

Project Introduction

Under this Phase I effort, MiTi proposes to establish the design of a high performance recuperator for integration with a Close Brayton Cycle turboalternator for space application, primarily for fission-based power generation technologies for surface missions on the moon and Mars. The proposed recuperator design will emphasize high effectiveness approaching or exceeding 90% in addition to being sized to minimize both volume and weight. Based on requirements for a 10 kWe He-Xe CBC power generating system the key recuperator design parameters such as inlet and exit pressures, temperatures and mass flow rates will be determined and the novel Quasi-Helical flow recuperator concept sized. Design iterations will be conducted to establish wall thickness to accommodate internal differential pressures as well as minimize system weight. This Mohawk Innovative Technology, Inc. (MiTi) proposal for development of a recuperator capable of satisfying the stringent requirements for a CBC system addresses NASA's stated need for space power systems technology. The preliminary design study will encompass all key aspects of recuperator design, including: 1) parametric Brayton cycle thermodynamic analyses to establish CBC turboalternator requirements and identify optimal operating condition; 2) recuperator sizing and layout to ensure high effectiveness and low pressure drop, 3) stress analysis and fabrication method down-selection to ensure hermetic (leak-proof) construction, 4) solid model of the integrated recuperator-turboalternator system showing the overall system configuration layout. Fabrication of a prototype unit would occur during a Phase II of the program.

Primary U.S. Work Locations and Key Partners





High Effectiveness and Low Pressure Drop Recuperator for Closed Brayton Cycle Turboalternator, Phase I Briefing Chart Image

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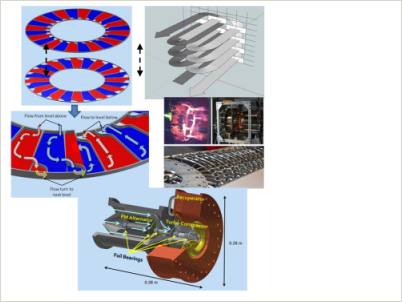
High Effectiveness and Low Pressure Drop Recuperator for Closed Brayton Cycle Turboalternator, Phase I

Completed Technology Project (2017 - 2017)

Organizations Performing Work	Role	Type	Location
Mohawk Innovative Technology, Inc.	Lead Organization	Industry	Albany, New York
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
New York	Ohio

Images



Briefing Chart Image
High Effectiveness and Low Pressure Drop Recuperator for Closed Brayton Cycle Turboalternator, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/126678)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Mohawk Innovative Technology, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

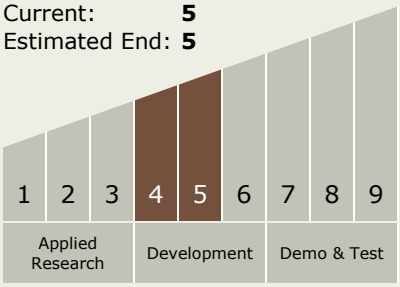
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Hooshang Heshmat

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



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Completed Technology Project (2017 - 2017)

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.4 Dynamic Energy Conversion

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System